

WHAT IS CLAIMED IS:

1. A nitride-based semiconductor element comprising:  
a substrate comprising a surface having projection  
5 portions;

a mask layer formed to be in contact with only said  
projection portions of said surface of said substrate;

a first nitride-based semiconductor layer formed on  
recess portions of said substrate and said mask layer; and

10 a nitride-based semiconductor element layer, formed  
on said first nitride-based semiconductor layer, having an  
element region.

2. The nitride-based semiconductor element according  
15 to claim 1, wherein

said substrate includes a substrate selected from a  
group consisting of a sapphire substrate, a spinel  
substrate, an Si substrate, an SiC substrate, a GaN  
substrate, a GaAs substrate, a GaP substrate, an InP  
20 substrate, a  $ZrB_2$  substrate and a quartz substrate.

3. The nitride-based semiconductor element according  
to claim 2, wherein

said substrate includes a sapphire substrate, and  
25 said mask layer and said projection portions of said

surface of said substrate are formed in the shape of stripes being parallel to the [1-100] direction of said sapphire substrate.

5           4. The nitride-based semiconductor element according to claim 2, wherein

          said substrate includes an Si substrate, and

          said mask layer and said projection portions of said surface of said substrate are formed in the shape of stripes being parallel to the [1-10] direction of said Si substrate.

10           5. The nitride-based semiconductor element according to claim 1, further comprising a buffer layer formed on the interface between said recess portions of said substrate and said first nitride-based semiconductor layer.

          6. A nitride-based semiconductor element comprising: an underlayer, formed on a substrate, consisting of a nitride-based semiconductor and comprising a surface having projection portions;

          a mask layer formed to be in contact with only said projection portions of said surface of said underlayer;

          a first nitride-based semiconductor layer formed on recess portions of said underlayer and said mask layer;

and

a nitride-based semiconductor element layer, formed on said first nitride-based semiconductor layer, having an element region.

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7. The nitride-based semiconductor element according to claim 6, further comprising a buffer layer formed between said substrate and said underlayer.

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8. The nitride-based semiconductor element according to claim 6, wherein

said substrate includes a substrate selected from a group consisting of a sapphire substrate, a spinel substrate, an Si substrate, an SiC substrate, a GaAs substrate, a GaP substrate, an InP substrate, a ZrB<sub>2</sub> substrate and a quartz substrate.

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9. The nitride-based semiconductor element according to claim 6, wherein

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said underlayer includes a GaN layer, and

said mask layer and said projection portions of said surface of said underlayer are formed in the shape of stripes being parallel to the [11-20] direction or the [1-100] direction of said GaN layer.

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10. A method of forming a nitride-based semiconductor comprising steps of:

forming projection portions on a surface on a substrate;

5 forming a mask layer to be in contact with only said projection portions of said surface of said substrate; and

growing a first nitride-based semiconductor layer on recess portions of said substrate and said mask layer through said mask layer.

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11. The method of forming a nitride-based semiconductor according to claim 10, further comprising a step of forming a buffer layer on said recess portions of said substrate in advance of said step of growing said

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first nitride-based semiconductor layer.

12. The method of forming a nitride-based semiconductor according to claim 10, wherein

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said steps of forming said projection portions on said surface on said substrate and forming said mask layer include a step of forming said mask layer on the surface of said substrate and thereafter etching the surface of said substrate through said mask layer thereby

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simultaneously forming said projection portions on said surface of said substrate and said mask layer coming into

contact with only said projection portions of said surface.

13. The method of forming a nitride-based semiconductor according to claim 10, further comprising a  
5 step of growing a nitride-based semiconductor element layer having an element region on said first nitride-based semiconductor layer.

14. The method of forming a nitride-based  
10 semiconductor according to claim 10, wherein

said substrate includes a substrate selected from a group consisting of a sapphire substrate, a spinel substrate, an Si substrate, an SiC substrate, a GaN substrate, a GaAs substrate, a GaP substrate, an InP  
15 substrate, a ZrB<sub>2</sub> substrate and a quartz substrate.

15. The method of forming a nitride-based semiconductor according to claim 14, wherein

said substrate includes a sapphire substrate, and  
20 said mask layer and said projection portions of said surface of said substrate are formed in the shape of stripes being parallel to the [1-100] direction of said sapphire substrate.

16. The method of forming a nitride-based

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semiconductor according to claim 14, wherein

said substrate includes an Si substrate, and

said mask layer and said projection portions of said surface of said substrate are formed in the shape of stripes being parallel to the [1-10] direction of said Si substrate.

17. A method of forming a nitride-based semiconductor comprising steps of:

forming an underlayer consisting of a nitride-based semiconductor on a substrate;

forming projection portions on a surface on said underlayer;

forming a mask layer to be in contact with only said projection portions of said surface of said underlayer; and

growing a first nitride-based semiconductor layer on recess portions of said underlayer and said mask layer through said mask layer.

18. The method of forming a nitride-based semiconductor according to claim 17, further comprising a step of forming a buffer layer on said substrate in advance of said step of forming said underlayer consisting of a nitride-based semiconductor.

19. The method of forming a nitride-based semiconductor according to claim 17, wherein

said steps of forming said projection portions on  
5 said surface on said underlayer and forming said mask  
layer include a step of forming said mask layer on the  
surface of said underlayer and thereafter etching the  
surface of said underlayer through said mask layer thereby  
simultaneously forming said projection portions on said  
10 surface of said underlayer and said mask layer coming into  
contact with only said projection portions of said surface.

20. The method of forming a nitride-based semiconductor according to claim 17, further comprising a  
15 step of growing a nitride-based semiconductor element  
layer having an element region on said first nitride-based  
semiconductor layer.

21. The method of forming a nitride-based  
20 semiconductor according to claim 17, wherein

said substrate includes a substrate selected from a  
group consisting of a sapphire substrate, a spinel  
substrate, an Si substrate, an SiC substrate, a GaAs  
substrate, a GaP substrate, an InP substrate, a ZrB<sub>2</sub>  
25 substrate and a quartz substrate.

22. The method of forming a nitride-based semiconductor according to claim 17, wherein

said underlayer includes a GaN layer, and

5        said mask layer and said projection portions of said surface of said underlayer are formed in the shape of stripes being parallel to the [11-20] direction or the [1-100] direction of said GaN layer.

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